

INTRODUCTION

The collapse of the Soviet Union and the end of the Cold War have not brought an end to the need for a strong defense against ballistic missile attacks. Instead of facing a potential confrontation with a global nuclear power, the United States faces challenges that are different but no less complex: the spread of nuclear weapons and other weapons of mass destruction into new parts of the world. These new threats increase the need for a strong, active ballistic missile defense using only the most advanced weapon systems.

BMDO's MISSION



■ PAC-3 (pictured above) provides the lower tier of the BMDO architecture. Its capabilities include defending troops and fixed assets from short- and medium-range ballistic missiles, cruise missiles, and hostile aircraft. *Photo courtesy of Raytheon Systems Company.*

BMDO is using a layered approach to protect U.S. forces and allies against ballistic missile attacks. This approach focuses on three priority areas: (1) theater missile defense (TMD), to address the short-range, widely dispersed threat from short-range ballistic missiles; (2) national missile defense (NMD), to address the long-range threat from intercontinental ballistic missiles; and (3) advanced technology, to continue advancing BMDO's capabilities to counter more complex future threats from ballistic missiles. Each priority area is discussed below.

THEATER MISSILE DEFENSE

BMDO's TMD program concentrates on low-altitude defenses where short-range (theater) ballistic missiles that travel less than 2,100 miles are a major threat. TMD is designed to protect U.S. forces, allies, and other countries, including geographic areas of vital interest to the United States, from theater missile attacks. It has the highest priority of the three programs because the current theater missile threat poses the highest risk to U.S. forces.

TMD focuses on land- and sea-based defenses for a lower and an upper tier, basically defined by the altitude at which an intercept takes place, the speed of the interceptor, and the speed of the enemy missile. Lower-tier TMD programs include the Patriot Advanced Capabilities-3 (PAC-3), the Navy Area Defense, and the Medium Extended Air Defense System. Upper-tier TMD programs include the Theater High Altitude Area Defense system (THAAD), Navy Theater-Wide Defense (NTW), and Airborne Boost-Phase Intercept. BMDO's core TMD programs—PAC-3, Navy Area Defense, THAAD, and NTW—represented the bulk of BMDO's research and development, test and evaluation, and procurement budget in fiscal year 1997.

NATIONAL MISSILE DEFENSE

BMDO's NMD program focuses on high-altitude defenses, prompted by concerns that so-called rogue states might some day develop missiles with ranges long enough to reach U.S. soil. The NMD concept is to develop and demonstrate an intercontinental ballistic missile defense system by 1999, continue development thereafter, and if necessary deploy an initial capability as early as

2003. This degree of flexibility is critical if BMDO is to be prepared for any world situation.

BMDO is pursuing a fixed, land-based architecture for its NMD program. The planned system includes six fundamental building blocks: the ground-based interceptor; ground-based radar; upgraded early warning radar; x-band radars; space-based infrared systems; and battle management/command, control, and communications systems.

ADVANCED TECHNOLOGY

BMDO's Advanced Technology program supports research on new technologies and options for improving existing systems. These new ideas include advanced interceptor technologies (improved sensor windows, projectile structures, guidance and control systems, and seekers); directed energy technologies (chemical lasers); and advanced sensor technologies (Midcourse Space Experiment, focal plane arrays, laser radar, and image-processing algorithms). Such technologies are vital for BMDO to stay ahead of increasingly sophisticated ballistic missile threats.

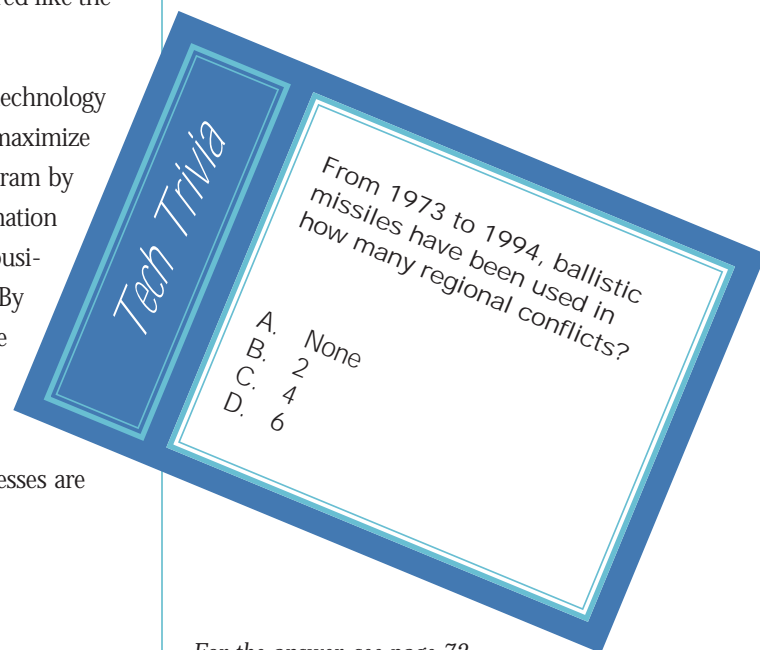
This program includes the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs. The SBIR program is designed to open the door to Federal research and development for small businesses and to speed the conversion of research findings to commercial products. Projects are funded in two competitive phases: In Phase I, the researcher demonstrates feasibility and develops a design concept; in Phase II, a prototype is built. The STTR program encourages cooperative joint research between businesses and nonprofit research institutions. It is structured like the SBIR program and operated by the same BMDO personnel.

Following the intent of Federal legislation, BMDO established a technology transfer effort—the Technology Applications (TA) program—to maximize research investments coming out of the Advanced Technology program by facilitating technology exchange. The TA program provides information about BMDO-developed technologies to U.S. corporations, small businesses, universities, entrepreneurs, and other government agencies. By doing this, it seeks to assist in the transfer of information between the developers of the technologies and those interested in using them.

BMDO has had many technology transfer successes in the 11 years since the TA program was founded. Some of the most recent successes are featured in this report.



■ Launched in 1996, the Midcourse Space Experiment (pictured above) is the first technology demonstration in space to characterize ballistic missile signatures during the important "midcourse" phase of flight between booster burnout and missile reentry.



For the answer, see page 72.

BMDO's TECHNOLOGY APPLICATIONS PROGRAM



■ Silicon Designs, which developed a miniature accelerometer for guiding BMDO interceptors, presented its business plan at a TA review and received commercialization feedback and guidance from the review panel. Today, the company's device is being used in the air bag systems (pictured above) of millions of Ford and Chrysler automobiles.

The TA program plays an important role in BMDO technology transfer by encouraging the commercialization of BMDO-funded technologies and widening their exposure to industry and the public. The program is implemented as a cooperative effort between BMDO and the National Technology Transfer Center, which provides an experienced group of technology transfer specialists with expertise in technology assessment, technology commercialization, intellectual property, and outreach. The following sections discuss the TA program's technology assessment and commercialization services as well as its latest outreach products and World Wide Web site.

BUSINESS FOCUS WORKSHOPS

Business Focus Workshops (BFWs) help small businesses implement a high-technology commercialization strategy for their BMDO SBIR or STTR Phase I projects. These one-day meetings help entrepreneurs translate research excellence into salable products. In a typical workshop, an SBIR project leader is linked with a technology transfer agent and a business consultant. This team creates a "business case" briefing; the researchers then present their cases to a panel of consultants for advice and feedback.

The 1997 workshops involved 22 SBIR companies. After their meetings, more than half of the companies asked for further assistance with issues raised during the workshops. Nine of these interactions produced specific company actions. For example, on the basis of a recommendation from one of the consultants, one company is considering an outside candidate for the post of chief operating officer.

The TA program expects many successful interactions to result from the 1998 BFWs, which involved 27 SBIR and STTR businesses. It is currently surveying the businesses that attended these workshops while preparing for next year's BFWs.

TECHNOLOGY APPLICATIONS REVIEWS

TA reviews are catalysts for the commercialization of BMDO-funded technologies. At these reviews, research and development professionals present summaries of their technologies for commercialization. Reviewers from industry, government, and universities respond to the presentations with opinions on new applications, commercial strategies, and technology transfer opportunities. The researchers then use this expert advice to shape their businesses, potentially making them more profitable and commercially driven.

Since 1989, roughly 375 researchers have presented their commercialization strategies to panelists in more than 54 TA reviews. In 1998, the review process focused on space, medicine, photonics, manufacturing, and electronic materials technologies. In previous years, reviews have focused on energy, networks, nanotechnology, and intelligent transportation.

OUTREACH PUBLICATIONS

An important part of the TA program's mission is raising industry and public awareness of BMDO-funded technologies with high commercial potential. The developers of BMDO-funded technologies often lack the funds to publicize their achievements. When these technologies cannot attract industry's interest, many of them wind up collecting dust on laboratory shelves.

To help gain visibility for these technologies, the TA program produces several types of outreach publications. For example, to reach those who may want to use BMDO technology, the TA program publishes a quarterly newsletter called the *BMDO Update*. The newsletter is a major component of BMDO's technology push efforts, featuring BMDO innovations that already are being commercialized or that have potential commercial applications. With more than 26 issues and 465 stories published since 1991, the *BMDO Update* has received and responded to more than 18,000 requests for information.

The TA program also focuses on areas where BMDO-funded technologies have high commercial potential and could significantly improve a particular U.S. industry. To highlight these areas and technologies, it produces detailed applications reports. Recent reports include *BMDO Technology and the Electric Utility Industry*; *BMDO Technologies for Biomedical Applications*; *BMDO Technologies—Improving the Environment*; and *BMDO Fiber-Optic Technologies for Telecommunications*. The TA program also produces the *Technology Applications Reports*, which features the top commercial success stories emerging from BMDO research and development efforts.

WORLD WIDE WEB SITE

To share information quickly and affordably with a large audience, BMDO has developed a World Wide Web site called BMDOLINK (<http://www.acq.osd.mil/bmdo/bmdolink/html/bmdolink.html>). This site features a wide range of BMDO news and information, including fact sheets, media briefings, and congressional testimonies.

BMDOLINK also has a technology transfer section (<http://www.acq.osd.mil/bmdo/bmdolink/html/transfer.html>). Updated periodically, this section features background information on the TA program, a multimedia library, and commercialization success stories. It also contains online versions of several BMDO technology transfer publications, which can be either downloaded or viewed online.



■ The *Update* newsletter (pictured above) spreads the word about all types of BMDO-funded technology with high commercialization potential. Applications reports, however, are more focused. The latest report, *BMDO Technologies—Improving the Environment* (pictured above), speaks to the important ways that BMDO technology has a direct impact on the environment.

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